

PV Inverter

SUNNY BOY 3000TL / 4000TL / 5000TL

Installation Guide



Display

Knocking on the lower lid:

- Activating the background illumination
- Switching through the energy values of the past 16 feed-in hours to the daily energy values of the past 16 days
- Switching through the line display

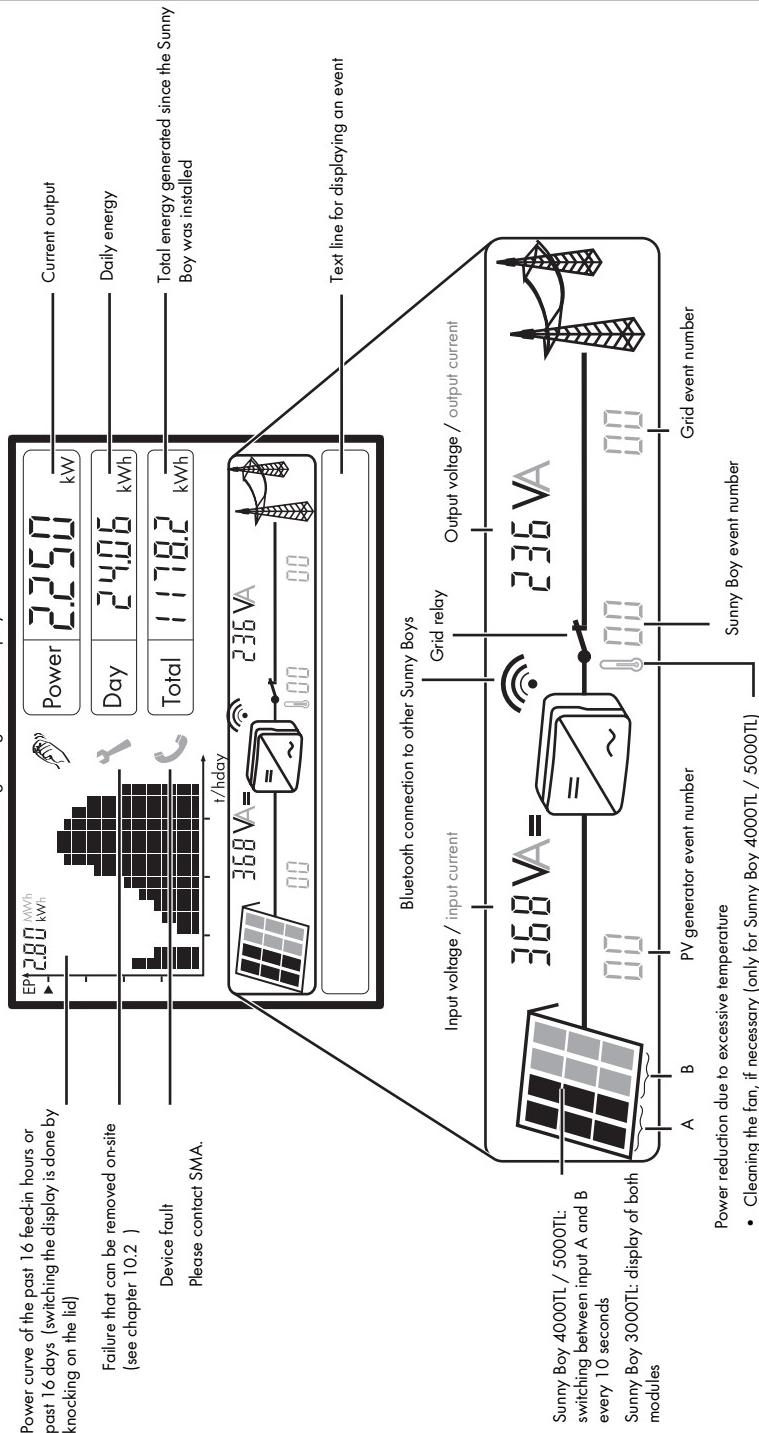


Table of Contents

1	Notes on this Manual	7
1.1	Validity	7
1.2	Target Group	7
1.3	Storage of Manuals	7
1.4	Additional Information	7
1.5	Symbols Used	8
2	Safety	9
2.1	Appropriate Usage	9
2.2	Safety Instructions	11
3	Unpacking	12
3.1	Scope of Delivery	12
3.2	Check for Transport Damage	12
3.3	Identification of the Sunny Boy	12
4	Mounting the Device	13
4.1	Selection of the Mounting Location	13
4.1.1	Dimensions and Weight	13
4.1.2	Ambient Conditions	14
4.1.3	Safety clearances	14
4.1.4	Position	15
4.2	Mounting Instructions	15
4.2.1	Mounting with Wall Bracket	15
4.2.2	Mounting with Top Hat Rail	19
5	Electrical Connection	22
5.1	Connection Area Overview	23
5.2	Connection to the Public Grid (AC)	24

5.3	Connection of the PV generator (DC)	30
5.3.1	Connection requirements Sunny Boy 3000TL	30
5.3.2	Connection requirements Sunny Boy 4000TL / 5000TL	31
5.3.3	Connection Procedure	32
5.4	Setting the installation country	35
5.4.1	Checking the Country Configuration	36
5.4.2	Configuration with rotary switches	38
5.5	Communication	39
5.5.1	Bluetooth	39
5.5.2	Fault Signaling Contact	40
5.5.3	Installing a Communication Module	43
6	Commissioning	45
7	Opening and Closing	46
7.1	Opening the Sunny Boy	46
7.2	Closing the Sunny Boy	48
8	Maintenance	50
8.1	Checking Heat Dissipation	50
8.1.1	Cleaning of the fan (only for Sunny Boy 4000TL / 5000TL)	50
8.1.2	Testing the fan (only for Sunny Boy 4000TL / 5000TL)	51
8.2	Inspection of the Electronic Solar Switch (ESS)	52
9	SD Card Slot	53
10	Messages	55
10.1	Update messages	55
10.2	Error Messages	56
11	Troubleshooting	62
11.1	Ground fault testing	62
11.2	Checking the Varistors	63

12	Decommissioning	66
12.1	Disassembly	66
12.2	Replacement of the housing covers	66
12.3	Packaging	68
12.4	Storage	68
12.5	Disposal	68
13	Technical Data	69
14	Accessories	72
15	Contact	73

1 Notes on this Manual

1.1 Validity

This installation guide describes the installation and commissioning of SMA Solar Technology inverters of the type Sunny Boy 3000TL (SB 3000TL-20), 4000TL (SB 4000TL-20) and 5000TL (SB 5000TL-20).

1.2 Target Group

Only qualified electricians may install and commission Sunny Boy units.

1.3 Storage of Manuals

All manuals for the Sunny Boy and the installed components must be stored with the system documentation and be accessible at all times.

1.4 Additional Information

You can download additional information from the download area at www.SMA.de. Technical information on the subjects of "laying out of a line circuit breaker" or parameter descriptions for example is available here.

1.5 Symbols Used

The following types of safety instructions and general information appear in this document:



DANGER!

"DANGER" indicates a hazardous situation which, if not avoided, will directly result in death or serious injury.



WARNING!

"WARNING" indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION!

"CAUTION" indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

ATTENTION!

"ATTENTION" indicates a situation that can result in property damage if not avoided.



Information

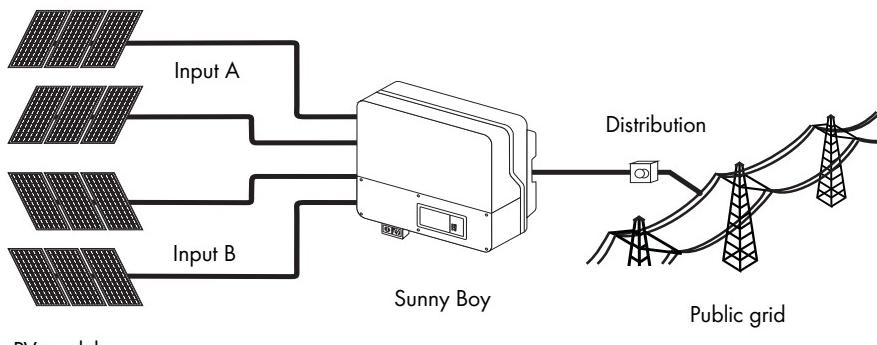
Information provides tips that are valuable for the optimal operation of the product.

2 Safety

2.1 Appropriate Usage

The Sunny Boy is a PV inverter which converts the DC current of a PV generator to AC current and feeds it into the public grid.

Principle of a PV system with this Sunny Boy



PV module

i Input B

Input B is only available on the Sunny Boys 4000TL and 5000TL.

The Sunny Boy may only be operated with PV generators (modules and cabling) of protection class II. Do not connect any sources of energy other than PV modules to the Sunny Boy.

PV modules with large capacities relative to ground, such as thin-film modules with cells on a metallic substrate, are only to be implemented if their coupling capacity is below 50 nF/kWp.

During grid feeding, a leakage current flows from the cells to ground. The magnitude of this current depends on the manner in which the modules are installed and, to no small extent, on the weather (rain, snow). This operational leakage current is not to exceed 50 mA.

When designing the PV system, ensure that the values comply with the permitted operating range of all components at all times. The free design program "Sunny Design" (www.SMA.de/en/SunnyDesign) will assist you. The manufacturer of the PV modules must have approved the modules for use with this Sunny Boy unit. You must also ensure that all measures recommended by the module manufacturer for long-term maintenance of the module properties are taken (see also Technical Information "Module Technology", in the download area of www.SMA.de).

Do not use the Sunny Boy for purposes other than those described here. Alternative uses, modifications to the Sunny Boy or the installation of components not expressly recommended or sold by SMA Solar Technology invalidates the warranty claims and operation permission.

Authorized Countries

The Sunny Boys 3000TL / 4000TL / 5000TL meet, with the corresponding settings, the requirements of the following standards and guidelines (as at 12/2008):

- VDE 0126-1-1 (02.2006)
- DK 5940 Ed. 2.2 (02.2006) (Certification of Sunny Boy 3000TL still in process)
- RD 1663/2000 (2000)
- PPC (06.2006)
- AS4777 (2005)
- EN 50438 (12.2007)

Upon request, SMA Solar Technology can set network parameters in-house according to customer specifications for other countries / installation locations, once these have been tested by SMA Solar Technology.

You can subsequently make adjustments via changes to the software parameters using relevant communications products (e.g. Sunny Data Control). For this, however, a personal password is required, which you can receive from the SMA Serviceline upon request.

2.2 Safety Instructions

**DANGER!**

Danger to life due to high voltages in the Sunny Boy!

- All work on the Sunny Boy must only be carried out by a qualified electrician.

**CAUTION!**

Danger of burn injuries due to hot housing parts!

During operation, the upper cover of the housing and the housing body may become hot.

- Only touch the lower housing cover during operation.

**CAUTION!**

Possible health risks due to the effects of radiation!

- Do not remain within a distance of less than 20 cm from the Sunny Boy for long periods of time.

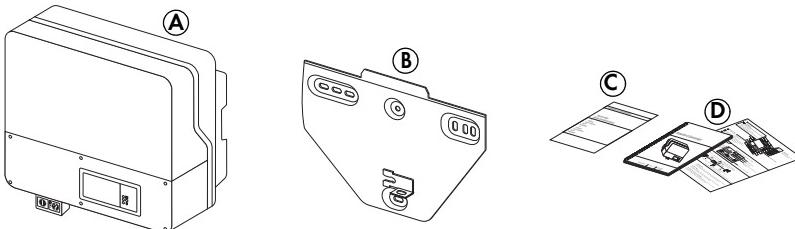
**Grounding the PV generator**

Comply with the local requirements for grounding the modules and the PV generator.

SMA Solar Technology recommends connecting the generator frame and other electricity conducting surfaces such that there is continuous conduction and to connect them to the ground in order to reach maximum protection for property and persons.

3 Unpacking

3.1 Scope of Delivery



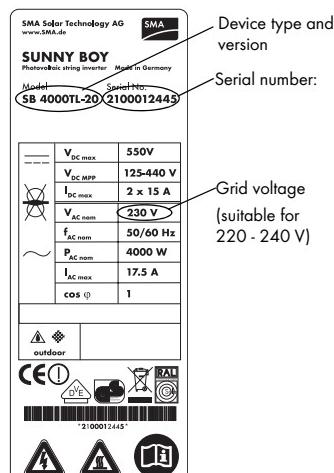
Object	Quantity	Description
A	1	Sunny Boy
B	1	wall bracket
C	1	Set of documents with explanations and certificates
D	1	Installation guide, including user manual
optional	1	Installation guide for communication module

3.2 Check for Transport Damage

Check the Sunny Boy for visible external damage, such as cracks in the housing or display. Please contact your dealer if you find any damage.

3.3 Identification of the Sunny Boy

You can identify the Sunny Boy using the name plate. The name plate is on the right side of the housing.



4 Mounting the Device

4.1 Selection of the Mounting Location



WARNING!

Danger to life due to fire or explosion!

The Sunny Boy housing can become hot during operation.

- Do not mount the Sunny Boy on flammable construction materials.
- Do not mount the Sunny Boy in areas where highly flammable materials are stored.
- Do not mount the Sunny Boy in areas where there is a risk of explosion.

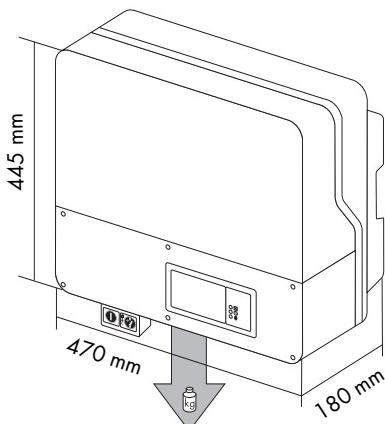


CAUTION!

Danger of burn injuries due to hot housing parts!

- Mount the Sunny Boy such that it cannot be touched inadvertently.

4.1.1 Dimensions and Weight



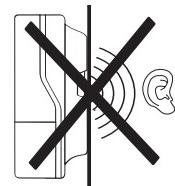
Sunny Boy 3000TL: 22kg

Sunny Boy 4000TL / 5000TL: 25 kg

4.1.2 Ambient Conditions

- The mounting location and mounting method must be suitable for the weight and dimensions.
- Mount on a solid surface.
- The mounting location must be accessible at all times.
- The ambient temperature should be below 40 °C at all times to guarantee optimal operation.
- Do not expose the Sunny Boy to direct sunlight, in order to avoid power reduction due to excessive heating.
- In a living area, do not mount the unit on plasterboard walls etc. in order to avoid audible vibrations.

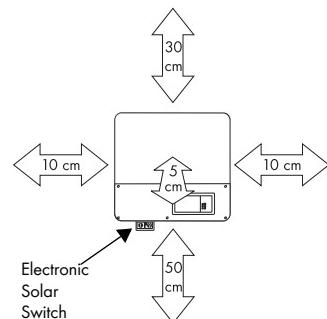
The Sunny Boy can make noises when in use which can be considered a nuisance when installed in a living area.



4.1.3 Safety clearances

Observe the following minimum clearances to walls, other devices or objects to guarantee sufficient heat dissipation and enough space for pulling the Electronic Solar Switch handle.

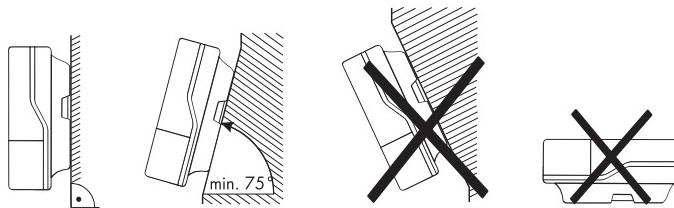
Direction	Minimum clearance
sides	10 cm
above	30 cm
below	50 cm
front	5 cm



Multiple Sunny Boys installed in areas with high ambient temperatures

If necessary, increase the clearance and ensure that the supply of cool air is sufficient to cool the Sunny Boys.

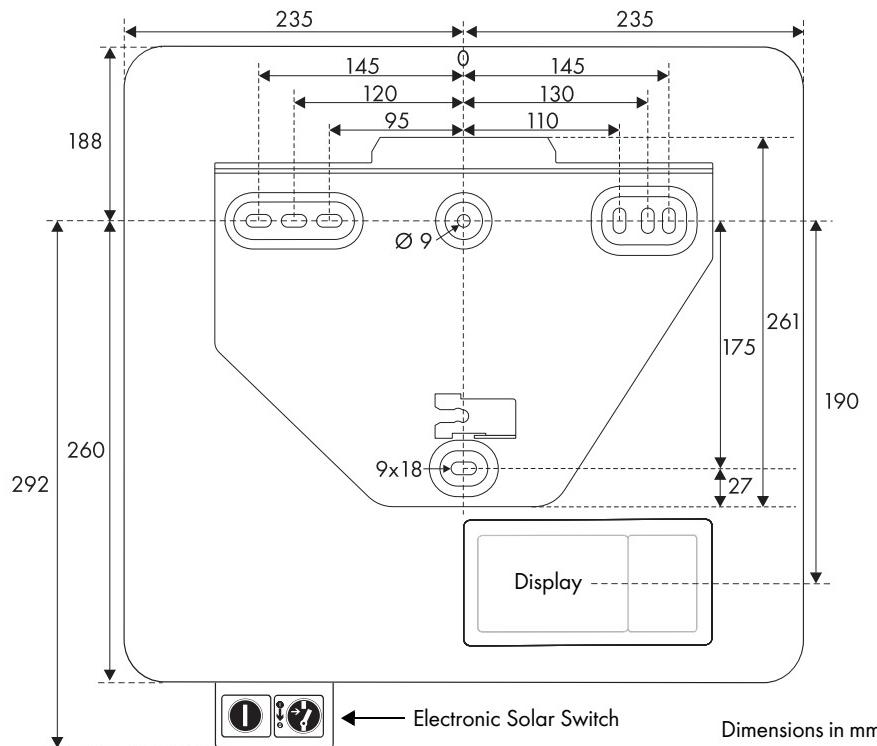
4.1.4 Position



- Install upright or tilted backwards by max. 15°.
- Never install the device with a forward tilt.
- Do not install horizontally.
- Install at eye level to allow operating status to be read at all times.

4.2 Mounting Instructions

4.2.1 Mounting with Wall Bracket



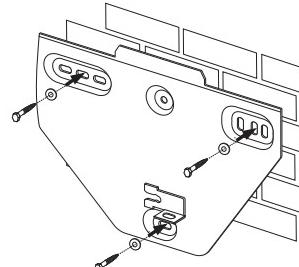
1. Use the wall mounting bracket as a drilling template and mark the positions of the drill holes.



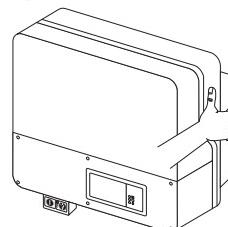
Number of drill holes used

- When wall mounting the unit, use at least two of the horizontal holes and the lowest hole in the middle.
- Use the two holes in the middle when mounting to a pillar.

2. Secure the wall bracket using suitable screws (at least 6 mm in diameter) and washers (min. outer diameter: 18mm).

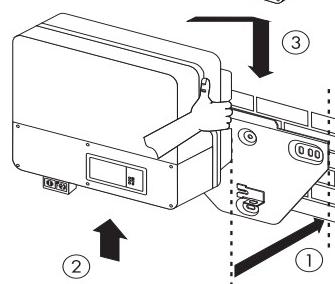


3. Transport the Sunny Boy using the handles at the sides of the Sunny Boy.

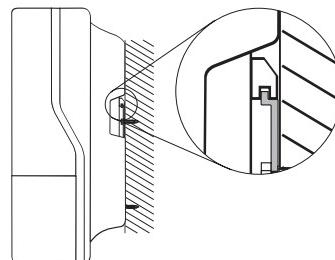


4. Attach the Sunny Boy to the wall bracket slightly to the left of its final position.

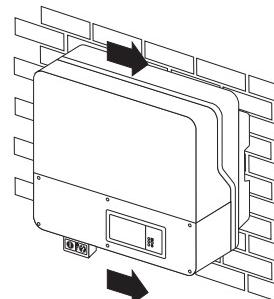
The right edge of the rear wall of the Sunny Boy must be flush with the right edge of the wall bracket.



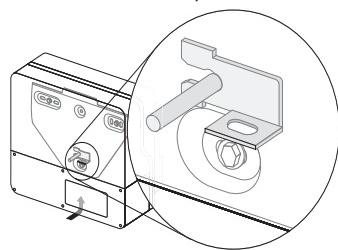
5. Check both sides for correct positioning.



6. Push the Sunny Boy to the right on the wall bracket, until it locks into place with the locking bolt on the rear wall.

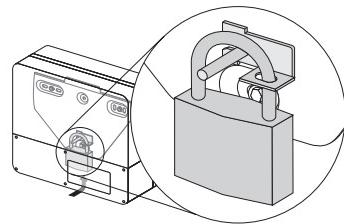


7. Check for correct position.



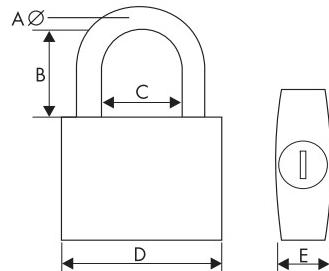
Optional anti-theft protection

The Sunny Boy can be secured to the wall bracket with a lock to protect it against theft.



The lock must meet the following requirements:

- Size:
 - A: 6 - 10 mm in diameter
 - B: 21 - 35 mm
 - C: 20 - 33 mm
 - D: 40 - 60 mm
 - E: 13 - 21 mm
- Stainless steel
- hardened shackle
- secured cylinder lock



Storing the key

Store the key carefully in case the device needs servicing.

4.2.2 Mounting with Top Hat Rail

Requirements for mounting of the top hat rail

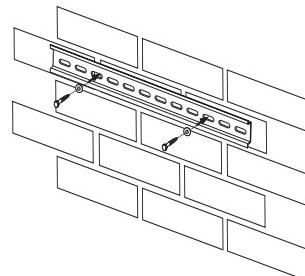
- Use a TH-35-7.5 mounting rail compliant with DIN EN 60715.
- Use stainless steel top hat rails and screws to prevent contact corrosion.
- Mount on level surfaces only.
- Use fastening material suitable for the surface.

Take into account the weight of the Sunny Boy when selecting fastening materials.

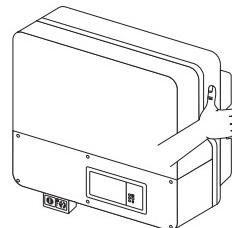
Mounting Procedure

1. Use the top hat rail as a drilling template and mark the positions of the drill holes.
2. Secure the top hat rail using suitable screws
(at least 6 mm in diameter) and washers
(min. outer diameter: 18mm).

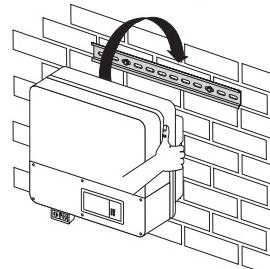
Secure one screw at least every 300 mm.



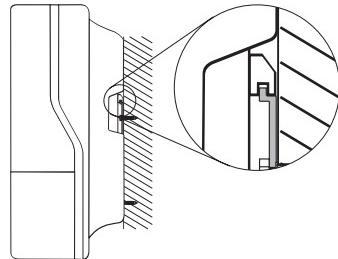
3. Transport the Sunny Boy using the handles at the sides of the Sunny Boy.



4. Attach the Sunny Boy to the top hat rail using the mounting opening in the rear wall.

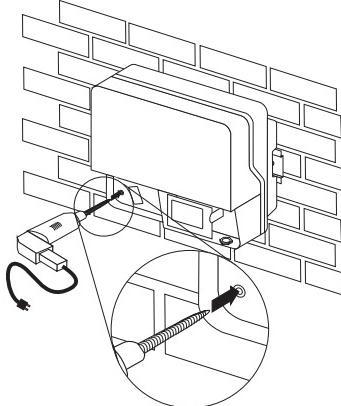
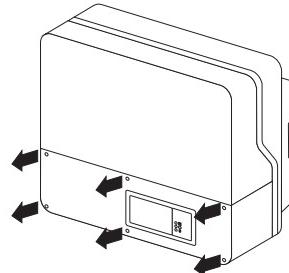


- Check both sides for correct positioning.



In order to prevent the Sunny Boy being pulled off, you must also screw it to the wall. To do so, proceed as follows:

- Remove the Electronic Solar Switch by pulling it downwards.
- Loosen all six non-removable lid screws and remove the cover.
- Drill through hole in the rear wall of the housing.
- Use a suitable drill bit at least 120 mm in length.
- Insert a wall anchor of the correct size.

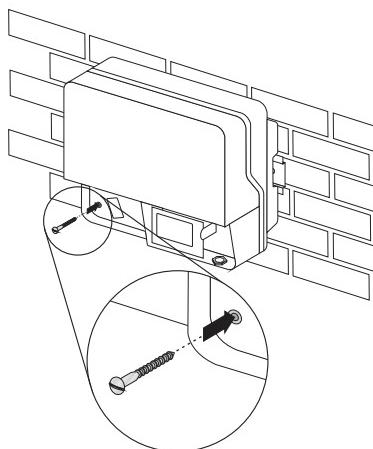


- Secure the Sunny Boy with a screw.

The screw must meet the following requirements:

Length:	min. 100 mm
Diameter:	>8 mm
Screw head:	not hexagon head, not countersunk

- Check that the unit is secure.



5 Electrical Connection



WARNING!

Electric shock due to short circuit!

If cables with different voltages are laid parallel to one another, short circuits can result if the cable insulation becomes damaged.

- Lay all cables separately.

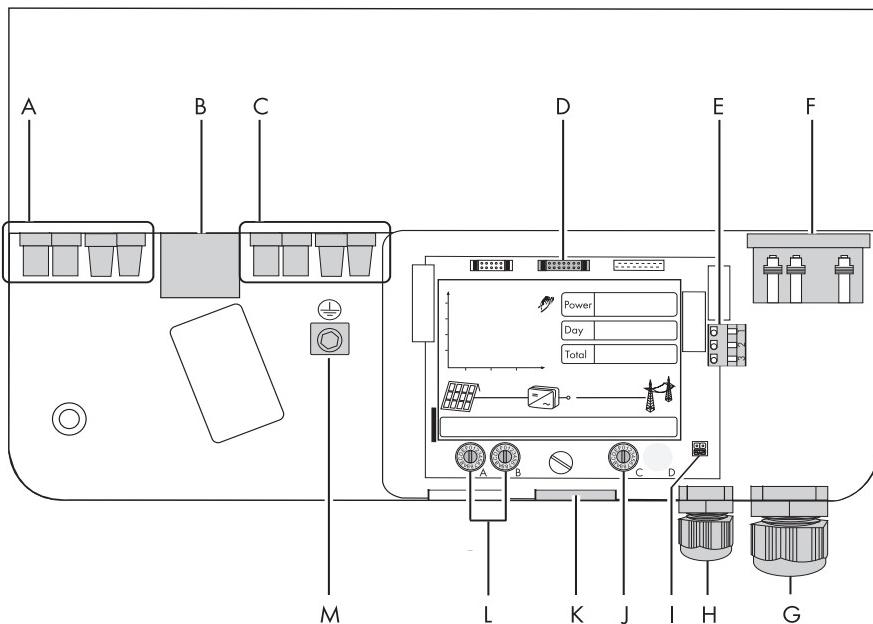
ATTENTION!

Electrostatic discharges can damage the Sunny Boy!

Internal components of the Sunny Boy can be irreparably damaged by static discharge.

- Ground yourself before touching a component.

5.1 Connection Area Overview



- A** Plug connectors for connecting the strings (input area A)
- B** Electronic Solar Switch (ESS) socket
- C** Plug connectors for connecting the strings (input area B)(only on Sunny Boy 4000TL / 5000TL)
- D** Plug for connecting the RS485 module (optional)
- E** Plug for connecting the fault signaling contact (optional)
- F** Terminal for grid connection
- G** Cable opening for grid connection (AC) (12 - 25 mm)
- H** Cable opening for the fault signaling contact (6 - 12 mm) (optional)
- I** Jumper for setting the language to English
- J** Rotary switch for setting Bluetooth communication
- K** Cable opening for communication via RS485 (optional)
- L** Rotary switch for country configuration
- M** Grounding terminal for additional grounding of the Sunny Boy

5.2 Connection to the Public Grid (AC)

Connection requirements

- Comply with the connection requirements of your utility operator.
- Ensure that the Sunny Boy is configured correctly for your country as described in section 5.4 „Setting the installation country“ (35).

Leakage current circuit breakers

The Sunny Boy is equipped with an integrated all-pole sensitive leakage current monitoring unit. This enables the Sunny Boy to automatically differentiate between real leakage currents and "normal" capacitive leakage currents.

If an external RCD or residual current breaker is mandatory, you must use a circuit breaker which is triggered at a leakage current of 100 mA or more.

Cable Design

The grid impedance of the AC cable should not exceed 1 Ohm. Otherwise the Sunny Boy will deactivate at full feed-in power due to excessive voltage at the grid connection point.

The cable cross-section should be sized using the "Sunny Design" design program (www.SMA.de) so that output losses do not exceed 1 % at nominal power.

The maximum cable length for each cable cross section is shown in the following table. Do not exceed the maximum cable length.

Cable cross section	Max. cable length		
	SB 3000TL-20	SB 4000TL-20	SB 5000TL-20
4.0 mm ²	23.5 m	not permitted	not permitted
6.0 mm ²	35.2 m	23.3 m	18.6 m
8.0 mm ²	47 m	31.1 m	24.8 m
10.0 mm ²	58.7 m	38.8 m	31.1 m

Load Disconnection Unit

You must safeguard each inverter with an individual circuit breaker in order that the inverter can be safely disconnected under load. The maximum permissible fuse protection is located in the technical data.



WARNING!

Danger to life due to fire!

If more than one inverter is connected in parallel to the same circuit breaker, the protective function of the circuit breaker is no longer guaranteed. This can lead to cable fire or the destruction of the inverter.

- never connect more than one inverter to one circuit breaker.
- Comply with the maximum permissible fuse protection when selecting the circuit breaker.



WARNING!

Danger to life due to fire!

When a generator (Sunny Boy) and a consumer are connected to the same line circuit breaker, the protective function of the line circuit breaker is no longer guaranteed. The current from the Sunny Boy and the grid can add up to overcurrent which is not detected by the line circuit breaker.

- Never connect consumers between the Sunny Boy and the circuit breaker without protection.
- Always install separate fuses for consumers.

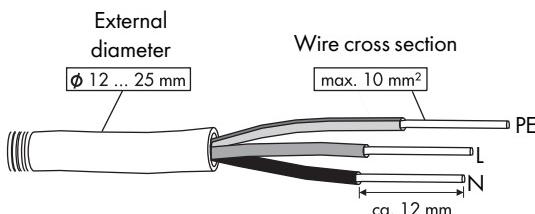


Permissible Load Disconnection Unit

Use only circuit breakers as load disconnection units!

A screw type fuse element, e.g. D system (Diazed) or D0 system (Neozed) is not a load disconnection device, and thus may **not** be used as a load disconnection unit. Upon disconnection under load, the screw type fuse element may be destroyed, or its functionality may be inhibited by contact burning. It only acts as cable protection.

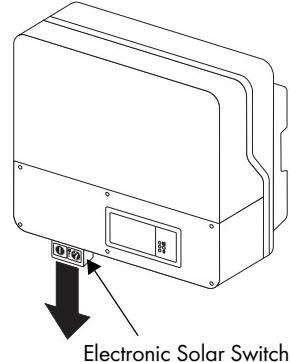
Cable Requirements



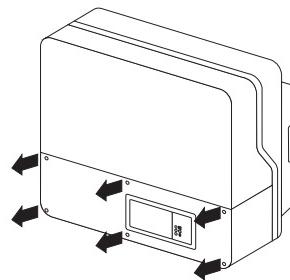
The PE wire must be 5 mm longer than the L and N wires.

Connection Procedure

1. Test the grid voltage and compare it with the permitted voltage range (see section 13 „Technical Data“ (69)).
2. Switch off the circuit breaker and secure it to prevent it from being reactivated.
3. Remove the Electronic Solar Switch.



4. Loosen all six non-removable lid screws and remove the cover.

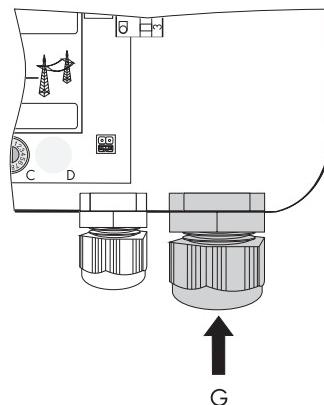


Further connections and settings

If you want to make further connections other than AC and DC, you should make them now before connecting the AC cable to give you more freedom of movement. This includes:

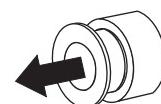
- Section 5.4 „Setting the installation country“ (35)
 - Section 5.5 „Communication“ (39)
 - Section 5.5.1 „Bluetooth“ (39)
 - Section 5.5.2 „Fault Signaling Contact“ (40)
 - Section 5.5.3 „Installing a Communication Module“ (43)
5. To make connection easier, loosen the screw on the display and flip up the display.

- Loosen the union nut of the AC screw clamp (see "G" on Page 23) slightly and remove the dummy plug from the cable opening.



Seal in the screw clamp

There is a two-part seal in the screw clamp. If necessary, the inner insert can be removed to insert a thicker cable.



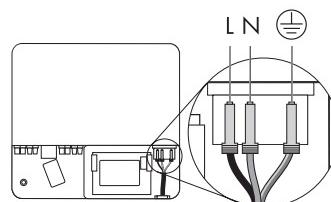
The following guideline values apply:

- Cable cross section with both seals: 12 - 16 mm
- Cable cross section with outer seal only: 15 - 21 mm

- Pull cable through.
- Flip up terminals of the AC terminal fully.
- Connect L, N and the protective earth (PE) to the AC terminal in accordance with the labels.

For this, the PE wire must be 5 mm longer than the L and N wires!

L and N may not be swapped!



CAUTION!

Danger of crushing when the terminals snap closed!

The terminals snap down rapidly and hard when closing.

- Press the terminals down with your thumb, do not grip the entire terminal on all sides.
- You should not hold your fingers under the terminal.

ATTENTION!**Danger of burning through the connection of two cables!**

There is danger of overheating or burning when two cables are connected to one terminal as a result of a poor electrical contact.

- Connect a maximum of one wire per terminal.

10. Close all terminals of the AC terminal again.
11. Screw the union nut of the screw clamp tightly to the cable opening again.

**DANGER!****Danger to life due to high voltages in the Sunny Boy!**

- Do not switch on the line circuit breaker until the PV generator has been connected and the Sunny Boy is securely closed.

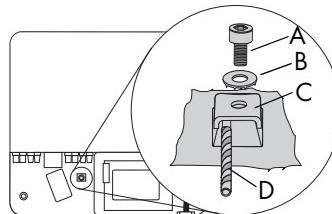
Additional Grounding of the Housing

If a second protective earth connection is required in the installation country (e.g. Switzerland), you can also ground the Sunny Boy with an additional protective earth on the connection terminal of the housing.

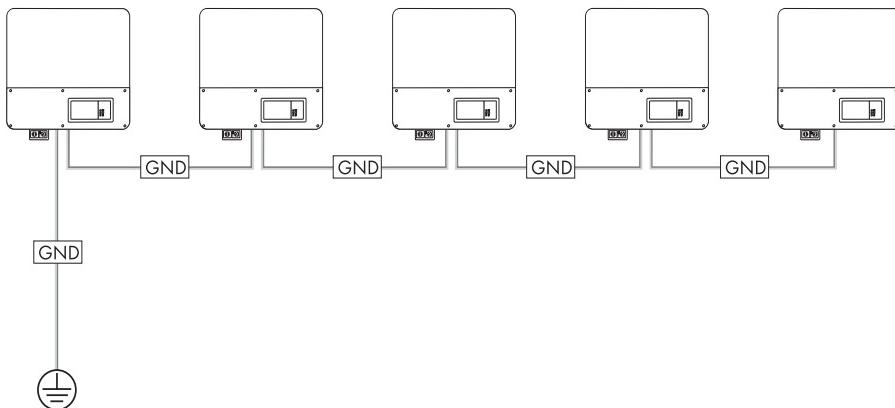
Proceed as follows:

1. Loosen screw (A) halfway.
2. Insert the stripped grounding cable (D) under the terminal clamp (max. cross section: 16 mm²).
3. Screw the terminal (C) tight.

The toothing of the washer (B) must face toward the terminal clamp.



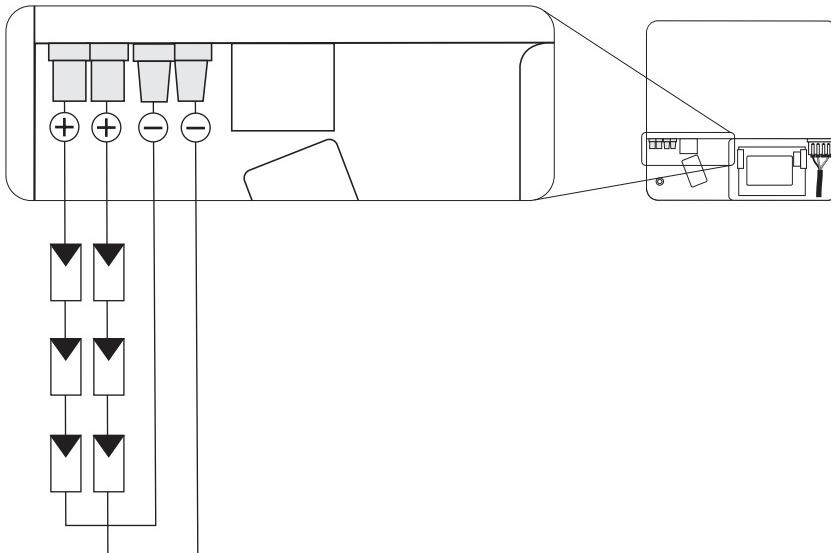
You can ground multiple Sunny Boys as shown below:



5.3 Connection of the PV generator (DC)

5.3.1 Connection requirements Sunny Boy 3000TL

Two strings can be connected to the Sunny Boy 3000TL



The following requirements are valid for the strings:

- Requirements for the connected modules:
 - same type
 - same quantity
 - identical alignment
 - identical tilt
- The connecting wires of the PV module must be equipped with plug connectors to allow the DC plug connectors of the Sunny Boy to be connected to it.

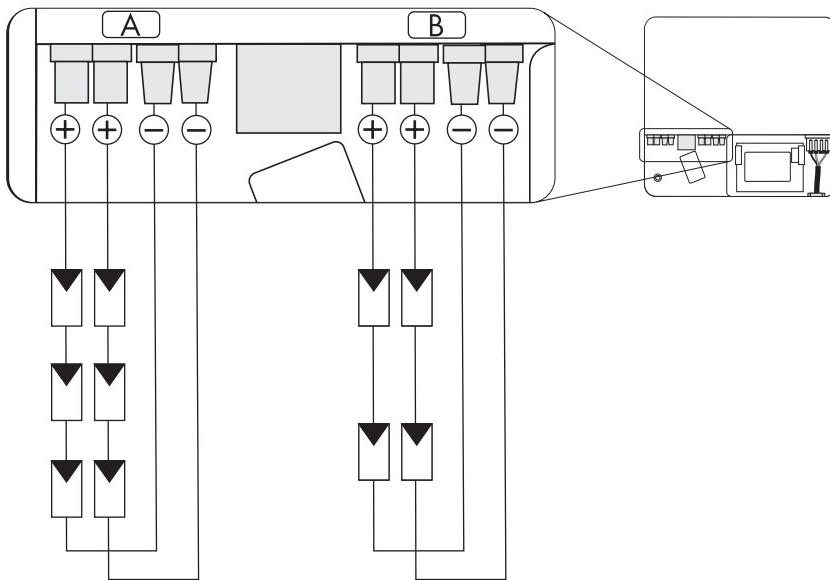
A pre-assembled set for connecting the free cable ends of a string is available as an accessory from SMA Solar Technology:

- The following limit values at the DC input of the Sunny Boy may not be exceeded:

Maximum input voltage	Maximum input current
550 V (DC)	17.0 A (DC)

5.3.2 Connection requirements Sunny Boy 4000TL / 5000TL

The Sunny Boy has two input areas "A" and "B", each with its own MPP tracker.



Up to two strings can be attached to each of the two input areas. These must fulfill the following requirements:

- Per input area (A or B) the following requirements of the connected modules apply:
 - same type
 - same quantity
 - identical alignment
 - identical tilt
- When connecting only two identical strings, it is more efficient to connect them to just one input area.

Exception: shadowed strings or if the total input current is greater than 15 A.



No mixed connection of input areas

For example, if the plus pole of a string is connected to input area A and the minus pole to input area B, this is described as mixed connection.

Connect the strings to one input area only and do not mix input areas A and B!

Otherwise, the Sunny Boy no longer fulfills the requirements of the EMC guideline (guideline on the ElectroMagnetic Compatibility of a device) and therefore loses its operation permission.

- The connection cables of the PV module must be fitted with plug connectors, so that they can be connected to the DC plug connectors (2 x 2 for input A and 2 x 2 for input B) of the Sunny Boy. A pre-assembled set for connecting the free cable ends of a string is available as an accessory from SMA Solar Technology:
- The following limit values at the DC input of the Sunny Boy may not be exceeded:

Maximum input voltage	Maximum input current	
	Input area A	Input area B
550 V (DC)	15.0 A (DC)	15.0 A (DC)

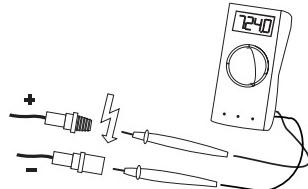
5.3.3 Connection Procedure



DANGER!

Danger to life due to high voltages in the Sunny Boy!

- Before connecting the PV generator, ensure that the AC line circuit breaker is switched off.
- Check the connection cables of the PV modules for correct polarity and that the maximum input voltage of the Sunny Boy is not exceeded.
Check the system design if the open circuit voltage of the PV modules is less than 10 % below the maximum input voltage of the Sunny Boy.



ATTENTION!

The Sunny Boy could be irreparably damaged by overvoltage!

If the voltage of the PV modules exceeds the maximum input voltage of the Sunny Boy, it could be irreparably damaged by overvoltage. All warranty claims become void.

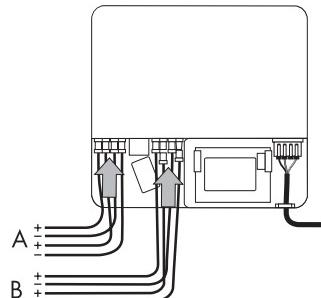
- Do not connect strings to the Sunny Boy with open circuit voltage greater than the maximum input voltage of the Sunny Boy.
- Check the system design.

- Check the strings for ground faults, as described in section 11.1 „Ground fault testing“ (62).
- Remove the sealing caps.

4. Connect the DC plug connectors.

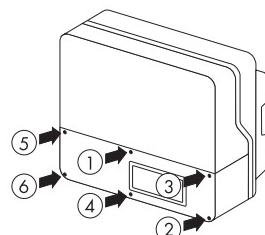
Ensure that the strings are assigned correctly (as described at the beginning of the section). Unused DC input sockets must be sealed with sealing caps.

The Sunny Boy 3000TL only has input area A!



5. Close the cover using the six screws again.

Tighten the screws in the sequence shown on the right to a torque of 1.4 Nm.



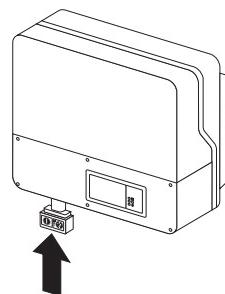
DANGER!

Risk of lethal electric shock!

A dangerous electric arc can form if the DC plug connector is removed without first removing the Electronic Solar Switch.

- Operate the Sunny Boy only when the cover is closed so that the DC plug connectors cannot simply be removed.
- Do not plug in the Electronic Solar Switch until the cover is closed.

6. Check the Electronic Solar Switch for wear as described in section 8.2 and connect it after successful testing.



ATTENTION!**Damage to the Electronic Solar Switch!**

If inserted incorrectly the Electronic Solar Switch can become damaged.

- Press the handle firmly into place on the socket of the Electronic Solar Switch! The handle must be flush with the housing.
- Check that the unit is secure. Check that the unit is secure.

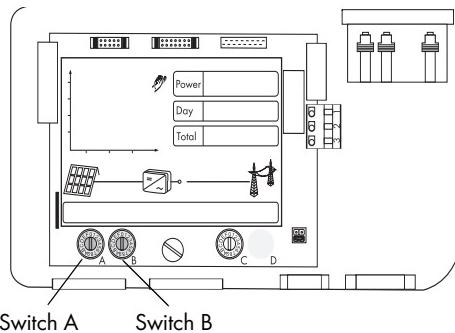
You can now commission the Sunny Boy as described in section 6 „Commissioning“ (45). The following connections and settings are optional.

5.4 Setting the installation country

The Sunny Boy can be configured for several countries. This is done using two rotary switches in the Sunny Boy or by configuring the parameters "GridGuard.CntrySet" using a communication device.

Switch position 0 / 0 is the setting on delivery. If you ordered the Sunny Boy with specific country configurations, the settings were made in the factory using a communication device. These settings are overwritten if the rotary switches or a communication device are used to make changes and cannot be restored automatically. If the unit was ordered without specifying the installation country, the standard setting is VDE0126-1-1 and the language is German.

Changes are saved immediately after the line circuit breaker is switched on. If an unassigned switch position is selected, the Sunny Boy displays an error message.



Protected country data sets

The local grid connection regulations in some countries require a device which prevents the parameters for grid feeding being changed. For this reason, some country data sets are protected.

Protected country data sets are automatically blocked 10 feed-in hours after commissioning or after the last change. If the country data set is changed after these 10 feed-in hours, the Sunny Boy does not accept the changes and displays the error message "Grid parameters locked". However, if a retrospective change to the country data set only involves changing the display language, the change is saved immediately.

The country data sets can also be set, manually locked or unlocked using a communication device ("GridGuard.CntrySet" parameter). The parameter "Inst.-Code" must be set to "54321" to lock the data set. It can only be unlocked by entering a personal unlocking code and is valid for a maximum of 10 feed-in hours. The language can be set without a password regardless of the country data set.



Changing parameters in protected country data sets

If parameters are changed in protected country data sets, they are no longer protected and "adjusted" is displayed instead of the standard. The parameter "Inst.-Code" must be set to "54321" to lock the data set manually.

The last change (switch or communication device) is always checked and accepted if applicable. I.e. the switch position may not always show the actual country configuration.

5.4.1 Checking the Country Configuration

Check that the Sunny Boy is set to the installation country.

Check that the country configuration is correct via the display message when (re-)commissioning (see section 6 „Commissioning“ (45)) or via the "SMA grid guard" measuring channel with the help of a communication device.

If necessary, change the setting via the "GridGuard.CntrySet" parameter using the communication device or via the rotary switch (as described in section 5.4.2 „Configuration with rotary switches“ (38)) according to the following table.

The settings in each parameter set are specified in the operation parameters. You can view these using a communication device or download them from www.SMA.de.

(A)	(B)	Parameter set	Display language	Protection	Country
0	0	Condition upon delivery	Condition upon delivery	depending on parameter set	depending on parameter set
0	1	is retained	English	depending on parameter set	depending on parameter set
0	2	is retained	German	depending on parameter set	depending on parameter set
0	3	is retained	French	depending on parameter set	depending on parameter set
0	4	is retained	Spanish	depending on parameter set	depending on parameter set
0	5	is retained	Italian	depending on parameter set	depending on parameter set
0	6	is retained	Greek**	depending on parameter set	depending on parameter set
0	7	is retained	Czech**	depending on parameter set	depending on parameter set
1	0	VDE0126-1-1	German	yes	Germany, Switzerland,
1	1	VDE0126-1-1 A ^{a)}	German	yes	Germany
1	8	VDE0126-1-1	French	yes	Switzerland, France
1	9	VDE0126-1-1 B ^{b)}	French	yes	France
2	0	VDE0126-1-1	Italian	yes	Switzerland
2	8	AS4777	English	no	Australia
3	0	DK5940E2.2	Italian	no	Italy
3	8		German	no	Italy
4	0	RD1663	Spanish	yes	Spain
4	8	PPC	Greek**	no	Greece

(A)	(B)	Parameter set	Display language	Protection	Country
4	9	PPC*	English	no	Greece
5	0	Kepco-guide	English	no	South Korea
5	8	G 83/1	English	no	England
6	0	EN 50438	German	yes	various EU countries
6	1	EN 50438	English	yes	
6	2	EN 50438	French	yes	
6	3	EN 50438	Italian	yes	
6	4	EN 50438	Spanish	yes	
6	5	EN 50438	Greek**	yes	
6	6	EN 50438	Czech**	yes	
7	0	EN50438-CZ	Czech**	yes	Czech Republic
7	1	EN50438-CZ	English	yes	Czech Republic
7	2	EN50438-CZ	German	yes	Czech Republic
7	8	C10/11*	French	yes	Belgium
7	9	C10/11*	English	yes	Belgium
7	A	C10/11*	German	yes	Belgium
E	0	Off-Grid	English	no	Flexible
E	1		German	no	
E	2		French	no	
E	3		Spanish	no	
E	4		Italian	no	
E	5		Greek**	no	
E	6		Czech**	no	
F	0	SD card	SD card	no	Flexible

a) Special setting: parameter "GridGuard.VolCtl.Rpro" = 244 V instead of 253 V

b) Special setting: Bluetooth transmission power reduced (in accordance with French requirements)

*) Availability on request

**) Currently not available. The previously set display language remains.

If the Sunny Boy is not set for the installation country, set it using the two rotary switches as described in section 5.4.2 „Configuration with rotary switches“ (38).

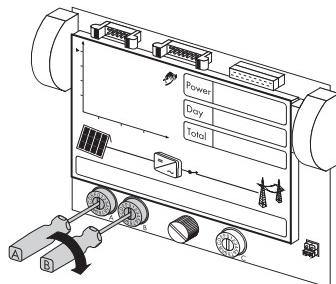
Alternatively you can make the settings via a communication device using the parameter "GridGuard.CntrySet".

If you require parameter settings adjusted for your installation location, you can change them with the help of a communication device or copy settings to the Sunny Boy using an SD card.

5.4.2 Configuration with rotary switches

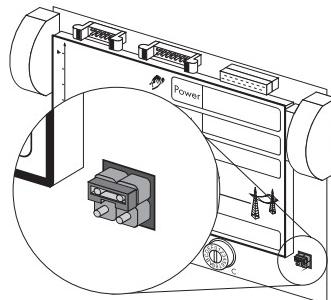
Proceed as follows for the configuration:

1. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (46).
2. Set the arrows on the rotary switches to the required position using a screwdriver (2.5 mm).



Jumper for English language

You can also set the language to English using a jumper (e.g. for service purposes in other countries). To do so, plug the jumper onto the upper two pins as shown on the right.



3. Close the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (48).

5.5 Communication

5.5.1 Bluetooth

Bluetooth communication with a communication device is activated by default. Bluetooth networking with other inverters is deactivated ex works.

The following settings can be made via the rotary switch:

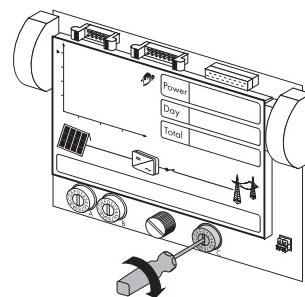
Switch position (NetID)	Setting
0	Off
1	Bluetooth communication with communication device possible, no networking with other inverters (factory setting).
2 ... F	Networking with other inverters

In order to distinguish the inverters of your system from those of adjacent systems for Bluetooth communication, you can assign an individual NetID for the inverters in your system (switch setting 2 ... F). However, this is only necessary if the adjacent system is within 500 m of your system.

All inverters in your system must have the same NetID to ensure that they are registered by your communication device.

To this end, proceed as follows:

1. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (46).
2. Set the arrow on the right rotary switch to the required position using a screwdriver (2.5 mm).
3. Close the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (48).



Saving the settings

The Bluetooth settings do not become active until the line circuit breaker is switched on again and after the PV generator is connected and the Electronic Solar Switch is plugged in.

5.5.2 Fault Signaling Contact

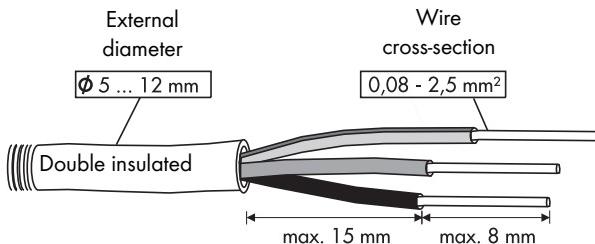
The Sunny Boy is fitted with a fault signaling contact as standard. It is connected simultaneously with the red error LED beside the display.

You can connect a separate consumer both in the event of errors and for trouble-free operation.

The following voltages and currents can be connected:

	Voltage	Current
AC	Max. 240 V	max. 1.0 A
DC	max. 30 V	max. 1.0 A

Cable Requirements

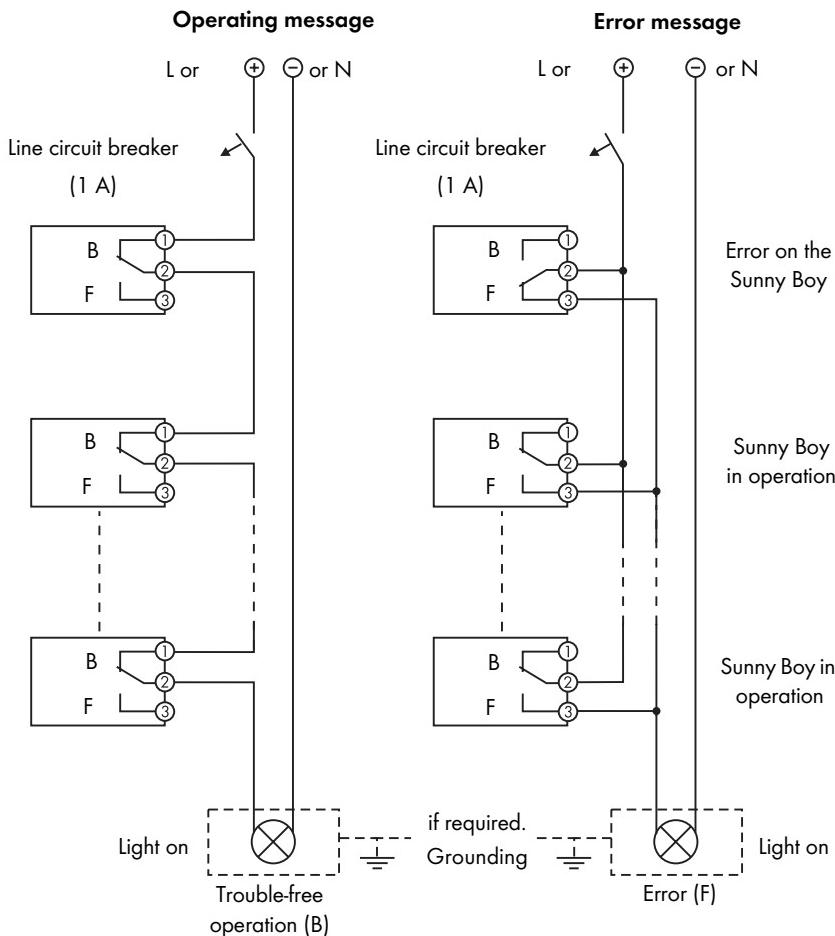


The cable type and laying method must be suitable for the application and use location.

Line circuit breaker

If the fault signaling contact is connected to the public grid, it must be protected with a separate line circuit breaker.

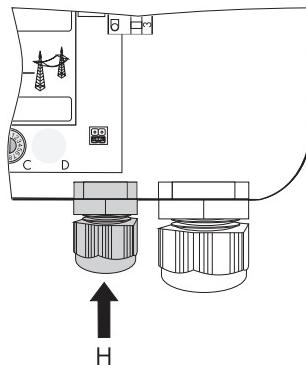
Connection plan



Connection Procedure

1. Switch off AC and DC supply voltage.
2. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (46).
3. Loosen the union nut of the screw clamp (see "H" Page 23) slightly and remove the dummy plug from the cable opening.

- Insert the cable into the Sunny Boy.

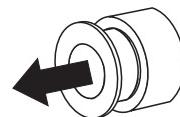


Seal in the screw clamp

There is a two-part seal in the screw clamp. If necessary, the inner insert can be removed to insert a thicker cable.

The following guideline values apply:

- Cable cross section with both seals: 5 - 7 mm²
- Cable cross section with outer seal only: 7 - 13 mm²

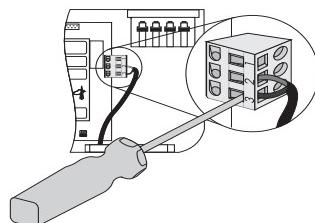


DANGER!

Danger to life due to high voltages in the Sunny Boy!

- Do not use cables with single insulation.
- Strip a maximum 15 mm of cable sheath.

- Remove the wire insulation a maximum 8 mm.
- Connect the wires to the plug as shown in the connection plan (see "E" Page 23), depending on whether an operating or error message is required.
- Secure the union nut of the screw clamp tightly to the cable opening again.
- Close the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (48).
- Switch on the supply voltage.



5.5.3 Installing a Communication Module

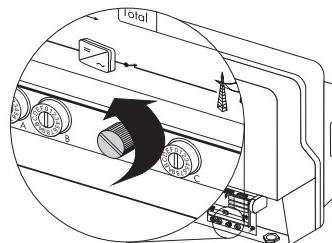
The communication module is used for wired communication with special data acquisition devices or a PC with corresponding software.

See the communication module documentation for a detailed wiring diagram.

This section describes how to install the communication module in the Sunny Boy.

For the installation, proceed as follows:

1. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (46).
2. Unscrew the display screw and flip the display up until it locks into place.



ATTENTION!

Damage to the communication module!

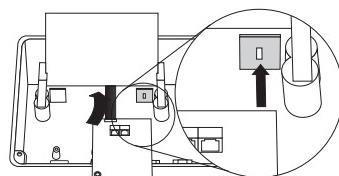
The communication module can be irreparably damaged by electrostatic discharge.

- Ground yourself before you remove the communication module from the packaging.

3. Insert the communication module and push the ribbon cable, situated behind the display, upwards.

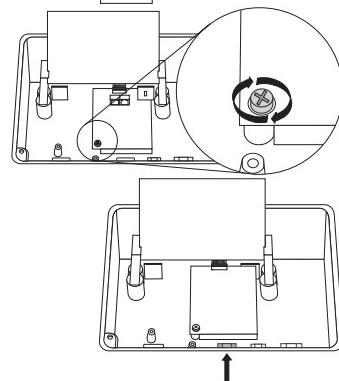
The guide lug of the rear edge of the module must slot into the hole in the plastic mount in the Sunny Boy.

4. Use the screw to secure the communication module.

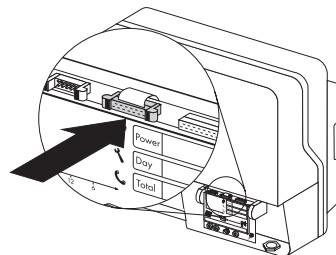


5. Wire the communication module as described in the module documentation.

6. Flip down the display and screw tightly.



7. Attach the ribbon cable to the multipoint connector.
8. Close the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (48).



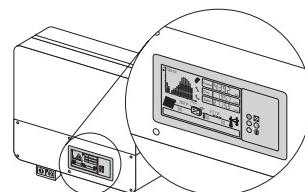
6 Commissioning

Check the following requirements before commissioning:

- Secure fit on wall bracket / top hat rail
- Correct country configuration (see section 5.4.2)
- correct connection of the AC (grid) cable
- Full connection of the DC cables (PV strings)
- Unrequired DC plug connectors in the DC connection area are sealed with sealing caps
- All housing openings are sealed
- the housing cover is securely screwed in place
- The Electronic Solar Switch is securely plugged in
- The AC distribution is installed correctly

Commissioning Procedure

1. Switch on the line circuit breaker.
2. If the radiation is sufficient, an illuminated green LED indicates undisturbed feeding-in. If this is the case, commissioning has been completed successfully.
If the green LED flashes for an extended period, this may be due to the fact that the DC radiation is not sufficient.
Measurements can only be made if the DC radiation is sufficient.
3. The meaning of the illuminated red LED and the meaning of the event numbers on the display are described in section 10.2 „Error Messages“ (56).



Display on initialization

1. First, the text line shows the firmware version of the internal processors.
2. After 5 seconds or after you knock on the cover, the series number or the identifier of the inverter are displayed. This identifier can be changed using a communication device.
3. After a further 5 seconds or when you knock again, the configured standard is displayed.
4. After a further 5 seconds or when you knock again, the configured language is displayed.
5. During normal operation, the scrolling text line of the display is subsequently empty. See section 10 „Messages“ (55) for the possible event messages and their meaning which can be displayed in the scrolling text line.

FW KP xxxxx HP xxxxx

2100237148

UDE0126-1-1

SPRACHE DEUTSCH

7 Opening and Closing

ATTENTION!

Electrostatic discharges can damage the Sunny Boy!

Internal components of the Sunny Boy can be irreparably damaged by static discharge.

- Ground yourself before touching a component.

7.1 Opening the Sunny Boy



DANGER!

Danger to life due to high voltages in the Sunny Boy!

Before opening the Sunny Boy:

- Switch off the circuit breaker and secure it to prevent it from being reactivated.
- Switch off the supply voltage to the fault signaling contact and secure it to prevent it from being reactivated (if applicable).

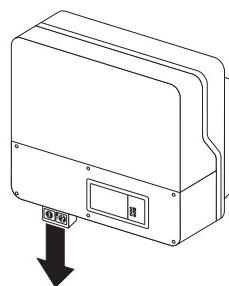


DANGER!

Risk of lethal electric shock!

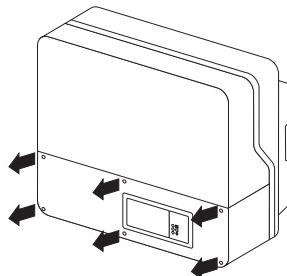
A dangerous electric arc can form if the DC plug connector is removed without first removing the Electronic Solar Switch.

- Remove the Electronic Solar Switch before opening the cover and removing the DC plug connectors.



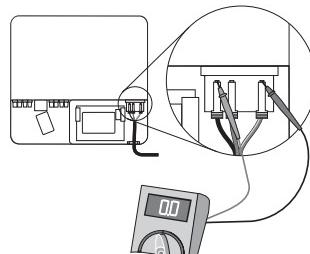
1. Wait until the LEDs, display and, if applicable, the error signal have gone out.

- Loosen all six non-removable lid screws and remove the cover.



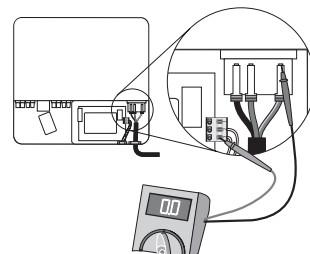
- Use a suitable measuring device on the AC terminal to ensure that there is no voltage present at PE. The maximum diameter of the test tip may not exceed 2 mm.

If voltage is found, check the installation!



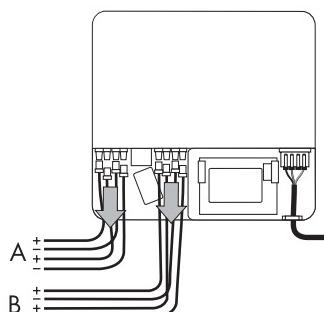
- Ensure there is no voltage present at the fault signalling contact to PE on all test contacts of the plug.

If voltage is found, check the installation!



- Disconnect the PV generator by removing all DC plug connectors from the Sunny Boy.

The Sunny Boy 3000TL only has input area A!

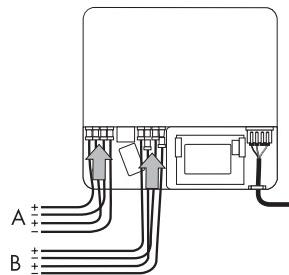


7.2 Closing the Sunny Boy

1. Connect the DC plug connectors.

Check that the polarity is correct and ensure that the strings are assigned correctly (as described in section 5.3 „Connection of the PV generator (DC)“ (30)).

The Sunny Boy 3000TL only has input area A!



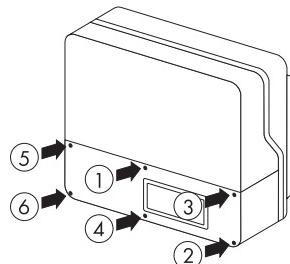
DANGER!
Risk of lethal electric shock!

A dangerous electric arc can form if the DC plug connector is removed without first removing the Electronic Solar Switch.

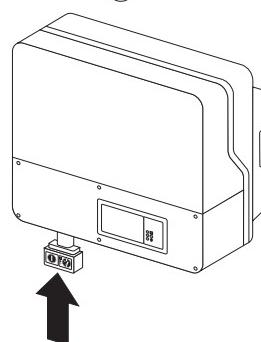
- Do not plug in the Electronic Solar Switch until the cover is closed.
- Operate the Sunny Boy only when the cover is closed so that the DC plug connectors cannot simply be removed.

1. Close the cover using the six screws.

Tighten the screws in the sequence shown on the right to a torque of 1.4 Nm.



2. Check the Electronic Solar Switch for wear as described in section 8.2 and connect it after successful testing.

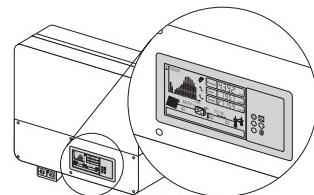


ATTENTION!**Damage to the Electronic Solar Switch!**

If inserted incorrectly the Electronic Solar Switch can become damaged.

- Press the handle firmly into place on the socket of the Electronic Solar Switch! The handle must be flush with the housing.
- Check that the unit is secure. Check that the unit is secure.

3. Switch on the line circuit breaker.
4. Switch on the supply voltage of the fault signaling contact (if present).
5. If the radiation is sufficient, an illuminated green LED indicates undisturbed feeding-in. If this is the case, commissioning has been completed successfully.
If the green LED flashes for an extended period, this may be due to the fact that the DC radiation is not sufficient.
Measurements can only be made if the DC radiation is sufficient.
6. The meaning of the illuminated red LED and the meaning of the event numbers on the display are described in section 10.2 „Error Messages“ (56).



8 Maintenance

8.1 Checking Heat Dissipation

If the Sunny Boy often loses power due to overheating (temperature symbol on the display lights up), this can be for the following reasons:

- The cooling fins on the rear of the housing are covered in dirt.
- The ventilation channels on the top are covered in dirt.
- The fan is clogged (only Sunny Boy 4000TL / 5000TL).

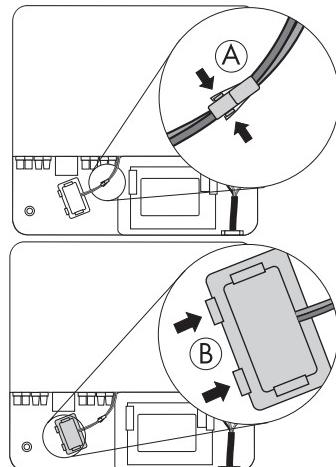
Clean the cooling fins and ventilation channels with a soft brush if necessary. Clean the fan as described below.

8.1.1 Cleaning of the fan (only for Sunny Boy 4000TL / 5000TL)

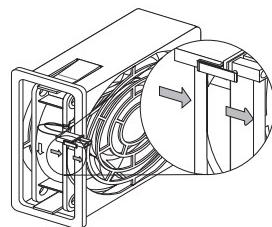
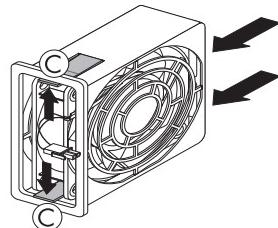
If the fan is only covered in loose dust, it can be cleaned with the help of a vacuum cleaner. If you do not achieve satisfactory results with a vacuum cleaner, you can dismantle the fan for cleaning.

If the housing and fan are heavily soiled, proceed as follows:

1. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (46).
2. Wait for the fan to stop rotating.
3. Unlock and unplug the fan connection plug (A).
4. Push both latches of the fan (B) towards the fan and remove the housing with the fan.



5. Push the upper and lower latches on the fan (C) outwards and press the fan out of the housing from the rear.
6. Clean the housing with a soft brush, a paint brush, a cloth or compressed air.
7. Clean the fan with a soft brush, a paint brush, or a cloth and water. Do not use compressed air as this can damage the fan.
8. After cleaning, assemble everything in reverse order and close the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (48).
The arrows on the fan housing and on the fan must point to the right on assembly.
The latches on the right of the fan housing must grip under the housing wall when inserted into the Sunny Boy.
9. The fan can be tested for function using a communication component, as described in the following section.



8.1.2 Testing the fan (only for Sunny Boy 4000TL / 5000TL)



Testing the Fan

You need a special data acquisition device (e.g. Sunny WebBox) or a PC with corresponding software (e.g. Sunny Data Control) to test the fan in order to be able to change the parameters of the Sunny Boy.

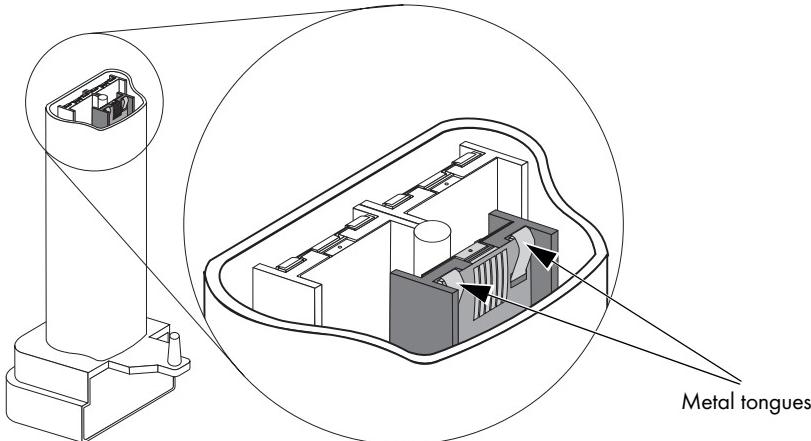
In addition you also need the installer password to access the installer mode.

1. Request the installer password from the SMA Technical Service Line (contact: see Page 73).
2. Set the "CoolSys.FanTst" parameter in installer mode to "on" (using a communication device).
3. Check the air flow of the fan. The Sunny Boy sucks air in from underneath and then blows it back out above. Listen for any unusual noise, which could indicate incorrect installation or that the fans are faulty.
4. After checking the fan, set the "CoolSys.FanTst" parameter back to "off".

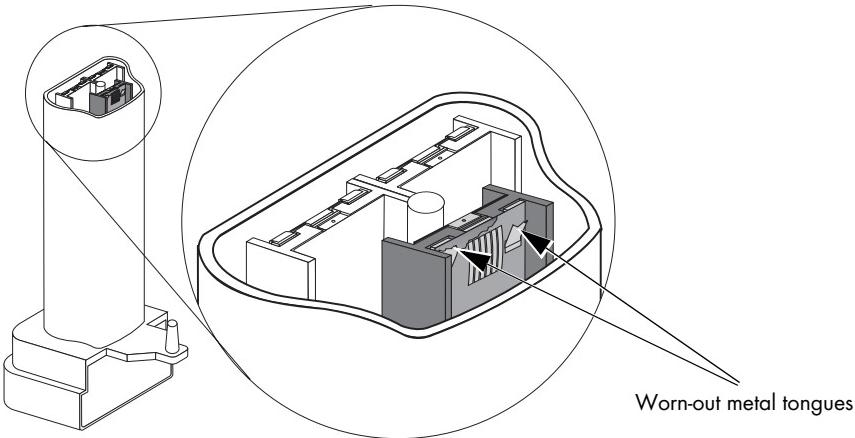
8.2 Inspection of the Electronic Solar Switch (ESS)

Check the Electronic Solar Switch for wear before plugging it in.

To do this, check the metal tongues on the inside of the plug for brown discoloration.



If the metal tongues are brown or completely burned out (see figure below), then the Electronic Solar Switch can no longer reliably disconnect the DC side.



You must replace the handle of the Electronic Solar Switch before you can reactivate the Sunny Boy. Replacements for damaged Electronic Solar Switch handles are available from your dealer.

9 SD Card Slot

There are many applications for which the reading from an SD card is required:

- A firmware update is required for discussion with the SMA Technical Service Line.
SMA will send you a file with the firmware update via e-mail.
- You require adapted parameter settings for your installation location.
Request this from SMA Solar Technology. SMA will then send you an e-mail containing a file with the corresponding settings and instructions on how to install them.
- Entering the Inst. code to unlock parameter sets (to allow you to configure a new country data set via the rotary switches or change parameters). If necessary, you can request instructions for the procedure from SMA Solar Technology, or they are sent with the required files.

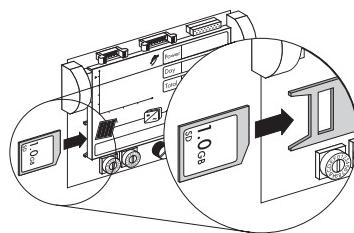
Use an SD card with a maximum 2 GB of storage space.

Firmware Update

1. Save the required files onto the SD card in the following directory:

SD card drive:\UPDATE

2. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (46).
3. Insert the SD card into the slot with the slanted corner at the bottom until it locks into place.
4. Close the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (48).
5. The Sunny Boy starts updating (the display shows < Reading SD card >).



Anomalous display messages

If the display shows messages other than those displayed here, there is an error. The error messages are described in section 10.2 „Error Messages“ (56) ordered by the event number on the display.

6. < Update file ok > is shown on the display after the update file has been read successfully.
7. The update messages of the components in question are then displayed consecutively (see section 10.1 „Update messages“ (55)).



Switching off the display

During the update, the display may be switched off for up to a minute (no display).

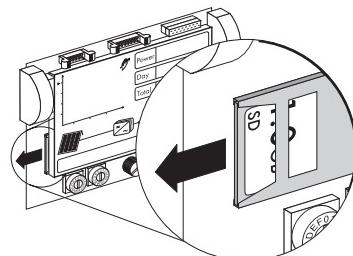
8. When the Sunny Boy has completed the update, < Update complete > is shown on the display and you can remove the SD card again.
9. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (46).

10. Push the SD card in a little and release it.

The SD card springs out a little and you can remove it.

11. Close the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (48).60

- 12.



10 Messages



If there is no DC voltage, the display is blank.

Measurements can only be made and messages can only be displayed if there is sufficient DC voltage (the green LED flashes or lights up).

10.1 Update messages

Corresponding display messages are shown in the scrolling text line of the display when an update is made.

Display	Description
< Inst.code valid >	The Inst. code entered is valid. The country data set configured is now unlocked and can be changed. If the country data set configured is protected, the unlocking is only valid for max. 10 feed-in hours.
< No new update on the SD card >	There is no update file relevant for this Sunny Boy on the SD card, or the update present has already been implemented.
< Grid parameters not changed >	The selected switch position is not assigned or there is no country data set on the SD card.
< The parameters were set successfully >	A new country data set was configured.
< Reading SD card >	The Sunny Boy is currently reading the SD card.
< Setting parameters >	The Sunny Boy is setting the configured parameters.
< Update complete >	The Sunny Boy has completed the update successfully.
< Bluetooth update >	The Bluetooth component was updated successfully.
< Display update >	Successful update of the display.
< Main computer update >	The inverter component was updated successfully.
< Communication update >	The communication component was updated successfully.
< RS485 module update >	Successful update of the communication interface.
< Language table update >	Successful update of the language table.
< Update file OK >	The update file found is valid.

10.2 Error Messages

Corresponding display messages are shown in the scrolling text line of the display with relevant event numbers. Knock on the housing cover to scroll through multi-line messages.

If an error persists for an extended period, the red LED begins to light and the fault signaling contact is activated.

No.	Cause	Remedy
1	<p>< Grid fault ></p> <p>The grid voltage is above the permitted range. This fault can have the following causes:</p> <ul style="list-style-type: none"> • The grid voltage at the connection point of the Sunny Boy is too high. • The grid impedance at the connection point of the Sunny Boy is too high. <p>For reasons of safety, the Sunny Boy disconnects itself from the grid.</p>	<ul style="list-style-type: none"> • Test the grid voltage and grid connection on the Sunny Boy. <p>If the grid voltage lies outside the acceptable range because of local grid conditions, ask the grid operator if the voltages can be adjusted at the feed-in point, or if they agree to changes in the values of the monitored operational limits.</p> <p>If the grid voltage is within the acceptable range, but the error is still displayed, contact the SMA Technical Service Line.</p>
2	<p>< Grid fault ></p> <p>The grid voltage is below the permitted range. This fault can have the following causes:</p> <ul style="list-style-type: none"> • Grid disconnected • AC cable damaged • The grid voltage at the connection point of the Sunny Boy is too low <p>For reasons of safety, the Sunny Boy disconnects itself from the grid.</p>	<ul style="list-style-type: none"> • Check the line circuit breaker triggering. • Test the grid voltage and grid connection to the Sunny Boy. <p>If the grid voltage lies outside the acceptable range because of local grid conditions, ask the grid operator if the voltages can be adjusted at the feed-in point, or if they agree to changes in the values of the monitored operational limits.</p> <p>If the grid voltage is within the acceptable range, but the error is still displayed, contact the SMA Technical Service Line.</p>

No.	Cause	Remedy
3	<p>< Grid fault ></p> <p>The average grid voltage over 10 minutes is no longer within the permissible range. This can be caused by the following:</p> <ul style="list-style-type: none"> • The grid voltage at the connection point of the Sunny Boy is too high. • The grid impedance at the connection point of the Sunny Boy is too high. <p>The Sunny Boy disconnects to allow compliance with the voltage quality of the grid.</p>	<ul style="list-style-type: none"> • Test the grid voltage at the connection point of the Sunny Boy. <p>If, due to the local grid conditions, the grid voltage exceeds the threshold configured, ask the utility operator whether the voltage at the feed-in point can be adjusted, or whether they agree to an alteration of the threshold for voltage quality monitoring.</p> <p>If the grid voltage is continually within the acceptable range, but the error is still displayed, contact the SMA Technical Service Line.</p>
4	<p>< Grid fault ></p> <p>The Sunny Boy is no longer in grid-parallel operation and has stopped feeding for safety reasons.</p>	<ul style="list-style-type: none"> • Check the grid connection for extreme, short-term fluctuations in frequency.
5	<p>< Grid fault ></p> <p>The grid frequency is outside the permitted range. For reasons of safety, the Sunny Boy disconnects itself from the grid.</p>	<ul style="list-style-type: none"> • If possible, test the grid frequency and the frequency of major fluctuations. <p>If repeated deviations occur and this is causing these errors, ask the grid operator if they agree to a modification of the operating parameters.</p> <p>Discuss the proposed parameters with the SMA Technical Service Line.</p>
6	<p>< Grid fault ></p> <p>The internal inverter monitoring has detected an excessively high direct current component in the grid current.</p>	<ul style="list-style-type: none"> • Check the grid connection for the DC component. • If this event occurs frequently, discuss with the utility operator whether the monitoring threshold can be raised.
7	<p>< Frequency impermissible ></p> <p>The grid frequency is outside the permitted range. For reasons of safety, the Sunny Boy disconnects itself from the grid.</p>	<ul style="list-style-type: none"> • If possible, test the grid frequency and the frequency of major fluctuations. <p>If repeated deviations occur and this is causing these errors, ask the grid operator if they agree to a modification of the operating parameters.</p> <p>Discuss the proposed parameters with the SMA Technical Service Line.</p>

No.	Cause	Remedy
8	< Grid Failure > Wait for grid voltage	<ul style="list-style-type: none"> • Check fuse. • Check AC installation. • Check whether there is a general power failure.
9	< no PE connection >	<ul style="list-style-type: none"> • Check AC installation. • Connect the PE cable to the AC terminal as described in section 5.2 „Connection to the Public Grid (AC)“ (24).
10	< L and N swapped >	<ul style="list-style-type: none"> • Correct the connection as described in section 5.2 „Connection to the Public Grid (AC)“ (24).
11	< Installation error > Second phase connected to N.	<ul style="list-style-type: none"> • Correct the connection as described in section 5.2 „Connection to the Public Grid (AC)“ (24).
33	< Unstable operation > The supply at the DC input of the Sunny Boy is not sufficient for stable operation.	<ul style="list-style-type: none"> • Wait for greater radiation. • If this occurs again at medium radiation, check the PV system design and correct connection of the PV generator.
34	< DC overvoltage > The DC input voltage at the Sunny Boy is too high.	<ul style="list-style-type: none"> • Disconnect the Sunny Boy from the PV generator immediately as described in section 7.1 „Opening the Sunny Boy“ (46)! Otherwise, the Sunny Boy could be irreparably damaged! • Check the DC voltage of the strings to ensure that they comply with the maximum input voltage of the Sunny Boy before connecting the Sunny Boy to the PV generator again.
35	< Ground fault > The Sunny Boy has detected a ground fault in the PV generator.	<ul style="list-style-type: none"> • Check the strings for ground faults, as described in section 11.1 „Ground fault testing“ (62). • Have the PV generator installation engineer fix the ground fault before you reconnect the string in question.

No.	Cause	Remedy
36	< High leakage current > The leakage current of the Sunny Boy and the PV generator is too high. This can be caused by a sudden fault in the connection to ground, a fault current or a malfunction. The Sunny Boy immediately stops feeding the mains system as soon as the limit has been reached and then automatically resumes normal operation when the fault is no longer present.	<ul style="list-style-type: none"> Check the strings for ground faults, as described in section 11.1 „Ground fault testing“ (62). Have the PV generator installation engineer fix the ground fault before you reconnect the string in question.
37	< Residual current excessive >	<ul style="list-style-type: none"> Check the strings for ground faults, as described in section 11.1 „Ground fault testing“ (62). Have the PV generator installation engineer fix the ground fault before you reconnect the string in question.
38	< DC Overcurrent > Overcurrent occurs on the DC side of the Sunny Boy and the Sunny Boy switches off.	If the event occurs frequently: <ul style="list-style-type: none"> Check the design and connection of the PV generator.
39	< Wait for DC start conditions > The input power or voltage of the PV modules is not yet sufficient for feeding into the grid.	<ul style="list-style-type: none"> Wait for greater radiation. If this occurs again at medium radiation, check the PV system design and correct connection of the PV generator.
60 - 64	< Device error >	<ul style="list-style-type: none"> Contact SMA Technical Service Line (see section 15 „Contact“ (73)).
65	< overtemperature > Sunny Boy deactivates due to excessive temperature.	<ul style="list-style-type: none"> Ensure ventilation is sufficient. Check heat dissipation as described in 8.1 „Checking Heat Dissipation“ (50).
66	< Device error >	<ul style="list-style-type: none"> Contact SMA Technical Service Line (see section 15 „Contact“ (73)).
67	< communication lost > A fault has occurred in the internal inverter communication. However, the Sunny Boy continues to feed power.	If the event occurs frequently: <ul style="list-style-type: none"> Contact SMA Technical Service Line (see section 15 „Contact“ (73)).
68 - 70	< Device error >	<ul style="list-style-type: none"> Contact SMA Technical Service Line (see section 15 „Contact“ (73)).

No.	Cause	Remedy
71	< SD card defective >	Re-format SD card. <ul style="list-style-type: none">• Re-save data onto the SD card.
	< Parameter file not found or defective >	<ul style="list-style-type: none">• Copy the parameter file to the directory SD card drive:\PARASET.
	< Parameter configuration unsuccessful >	<ul style="list-style-type: none">• Check parameters for valid values.• Ensure that the Inst.Code is set to authorize changes.
	< Update file fault >	<ul style="list-style-type: none">• Re-format SD card.• Re-save data onto the SD card.
	< No update file found >	<ul style="list-style-type: none">• Copy the update file to the directory SD card drive:\UPDATE.
72	< Data cannot be saved > Internal device fault, but the Sunny Boy continues to feed power.	<ul style="list-style-type: none">• If the fault occurs frequently, contact SMA Technical Service Line (see section 15 „Contact“ [73]).
73	< Main computer update not successful > Internal device fault.	<ul style="list-style-type: none">• Contact SMA Technical Service Line (see section 15 „Contact“ [73]).
	< RS485I module update not successful > Internal device fault, but the Sunny Boy continues to feed power.	<ul style="list-style-type: none">• Attempt update again.• If the fault occurs again, contact SMA Technical Service Line (see section 15 „Contact“ [73]).
	< Bluetooth update not successful > Internal device fault, but the Sunny Boy continues to feed power.	
	< Display update not successful > Internal device fault, but the Sunny Boy continues to feed power.	
74	< Language table update not successful > Internal device fault, but the Sunny Boy continues to feed power.	
	< Varistor fault >	<ul style="list-style-type: none">• Check the varistors as described in section 11.2 „Checking the Varistors“ (63).
80	< Derating pending > The power output of the Sunny Boy was reduced to below the nominal power for more than 10 minutes due to excessive temperatures.	If the event occurs frequently: <ul style="list-style-type: none">• Ensure ventilation is sufficient.• Check heat dissipation as described in 8.1 „Checking Heat Dissipation“ (50).

No.	Cause	Remedy
90	< Inst.-Code invalid > The Inst. code (personal installer password) entered is not valid.	<ul style="list-style-type: none"> Enter a valid Inst. code.
	< Grid parameters locked > The current country data set is locked.	<ul style="list-style-type: none"> Enter a valid Inst. code to change the country data set.
	< Waiting for main computer > <ul style="list-style-type: none"> The DC voltage at the DC input is not sufficient to operate the main computer. The selected rotary switch setting is not assigned for the country configuration. The parameters to be changed are protected. 	<ul style="list-style-type: none"> Ensure that sufficient DC voltage is available (green LED lights or flashes). Check the setting of the rotary switch (see section 5.4.2 „Configuration with rotary switches“ (38)). Enter Inst. code.

11 Troubleshooting

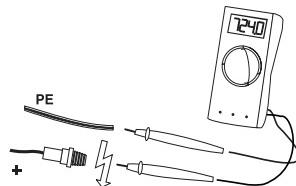
11.1 Ground fault testing

If the Sunny Boy displays event number "35", "36" or "37", there is probably a ground fault in the PV generator.

Check the strings for ground faults as described below:

1. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (46).
2. Measure the voltages between the plus and minus pole of a string against the ground potential.

If a voltage is present, there is a ground fault in the corresponding string.



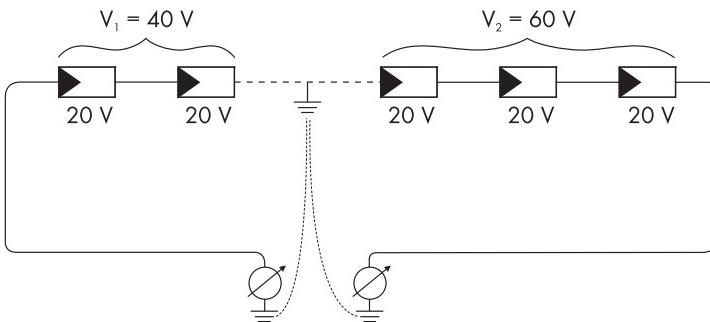
DANGER!

Lethal danger due to live PV generator!

- Do not touch the frame of the PV generator.
- Do not connect strings with ground faults to the Sunny Boy.
- Wait until no voltage can be measured.

The approximate position of the ground fault can be determined from the ratio of the measured voltages between plus against ground potential and minus against ground potential.

Example:



In this case, the ground fault is between the second and third module.

3. Repeat step 2 for each string.
4. Close the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (48).

11.2 Checking the Varistors

If the Sunny Boy shows event number "74", one of the varistors is probably defective.

Varistors are wearing parts, whose functioning diminishes with age or due to repeated responses as a result of overvoltage. It is therefore possible that one of the thermally monitored varistors has lost its protective function.

Check the varistors as described below:

1. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (46).

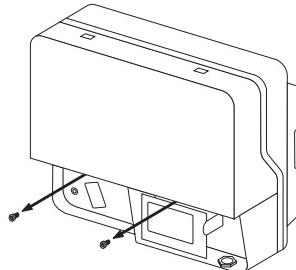


DANGER!

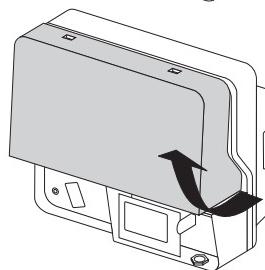
Danger to life due to high voltages in the Sunny Boy!

Wait five minutes before opening the upper cover, so that the capacitors can discharge!

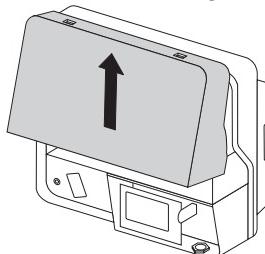
2. Loosen the screws on the upper cover.



3. Pull the cover forwards at the bottom edge.



4. Push the cover upwards and remove it.



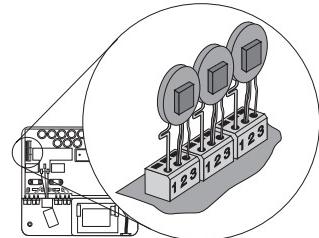
ATTENTION!**Electrostatic discharges can damage the Sunny Boy!**

The Sunny Boy can be damaged irreparably by electrostatic discharge to its internal components.

- Ground yourself before touching a component.

5. Use a Multimeter to check all the varistors and see if there is a conducting connection between connectors 2 and 3.

The Sunny Boy 3000TL has only two varistors.

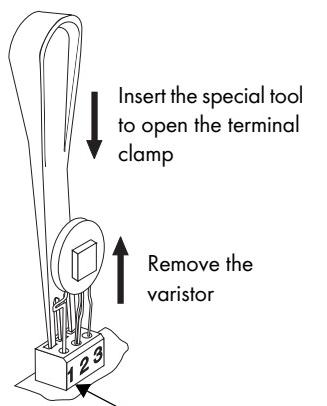


Event	Measure
There is a conducting connection.	<p>There is probably another fault in the Sunny Boy.</p> <ul style="list-style-type: none"> • Continue with point 9. • Discuss further steps with the SMA Technical Service Line.
There is no conducting connection.	<p>The respective varistor is defective and must be replaced.</p> <p>The varistors are specially manufactured for use in the Sunny Boy and are not commercially available. They must be ordered directly from SMA Technologie AG (SMA order code: "SB-TV4" for SB3000TL-20, "MSWR-TV8" for SB 4000TL-20 / 5000TL-20).</p> <p>To replace the part, proceed to step 8.</p>

6. Replace all varistors with new ones as shown in this drawing. Varistor failure is generally due to influences which affect all varistors similarly (temperature, age, induced overvoltages).

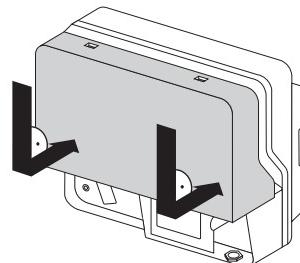
If you do not receive a special tool for operating the terminals together with your replacement varistors, please contact SMA Solar Technology. As an alternative, the terminal contacts can be operated using a 3.5 mm wide screwdriver.

Ensure the varistor is installed the right way round!

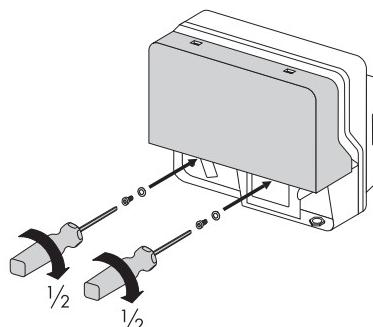


The pole with the small loop (crimp) must be fitted to terminal 1 when replacing the varistor.

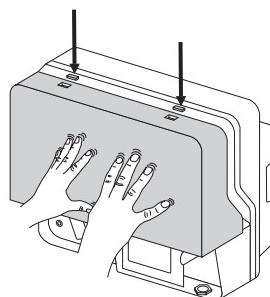
7. replace the cover upright.



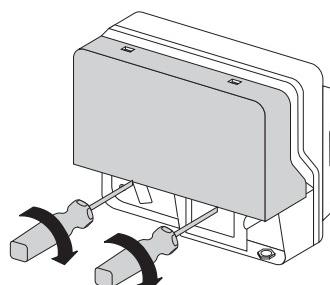
8. Half tighten the screws with the washers.



9. Push the cover onto the housing until it clicks into place above.



10. Secure the two cover screws with a torque of 2.4 Nm.



11. Close the lower cover and re-commission the Sunny Boy as described in section 7.2 „Closing the Sunny Boy“ (48).

12 Decommissioning

12.1 Disassembly

1. Open the Sunny Boy as described in section 7.1 „Opening the Sunny Boy“ (46).
2. Remove all connection cables from the Sunny Boy.



CAUTION!

Danger of burn injuries due to hot housing parts!

- Wait 30 minutes for the device to cool before dismantling it.

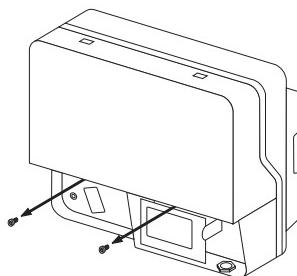
3. For top hat rail mounting: Loosen the screw between the housing and wall.
4. Open the safety lock if necessary.
5. Push the Sunny Boy to the left and remove it from the wall bracket or the top hat rail.

12.2 Replacement of the housing covers

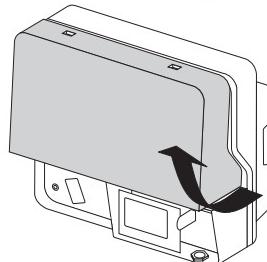
In the event of faults, it can be the case that your Sunny Boy has to be replaced. In this case you will receive a replacement device upon which transport covers are mounted.

Before you send your Sunny Boy back to SMA Solar Technology, you must replace the upper and lower covers of your Sunny Boy with the transport covers.

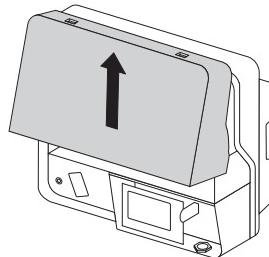
1. Dismantle the Sunny Boy as described in section 12.1 „Disassembly“ (66).
2. Loosen the screws on the upper cover.



3. Pull the cover forwards at the bottom edge.



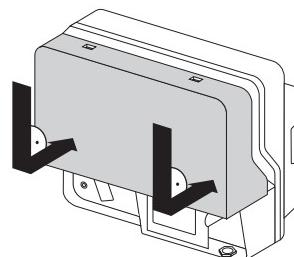
- Push the cover upwards and remove it.



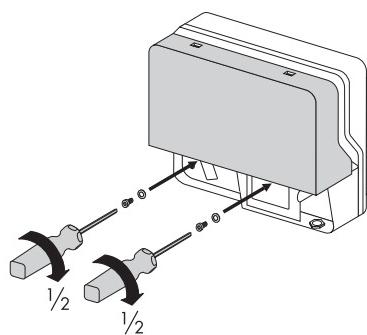
- Remove the transport covers from the replacement device in the same manner.

Now mount the transport covers of the replacement device onto your sunny Boy:

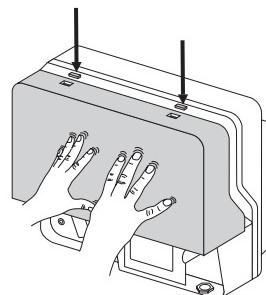
- Install the cover upright.



- Half tighten the screws with the washers.

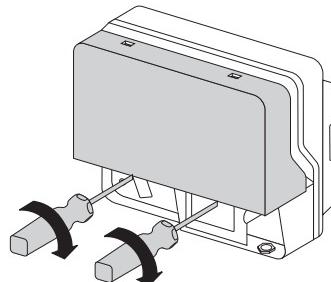


- Push the cover onto the housing until it clicks into place above.



4. Secure the two cover screws with a torque of 2.4 Nm.
5. Secure the lower cover.

You can now send your Sunny Boy back to SMA Solar Technology.



6. Secure the upper cover of your Sunny Boy onto the replacement device in the same manner.
7. Mount the replacement device again (see section 4.2) and connect (see section 5).

12.3 Packaging

If possible, please pack the Sunny Boy in the original packaging.

If this is no longer available, you can also use an equivalent carton that fulfills the following requirements:

- Suitable for loads of at least 25 kg
- With handle system
- Can be closed fully

12.4 Storage

Store the Sunny Boy in a dry place where ambient temperatures are always between -25 °C and +60 °C.

12.5 Disposal

Dispose of the Sunny Boy at the end of its service life in accordance with the disposal regulations for electronic scrap which apply at the installation site at that time. Alternatively, send it back to SMA Solar Technology with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("for disposal") (contact see Page 73).

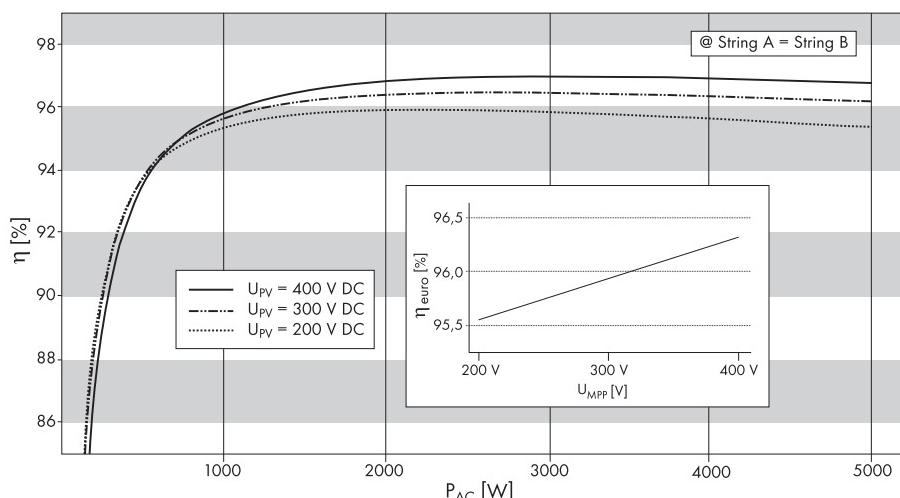
13 Technical Data

		SB 3000TL-20	SB 4000TL-20	SB 5000TL-20					
PV generator connection data									
Max. input voltage	$U_{DC\ max}$	550 V ^{a)}							
Input voltage, MPP range	U_{PV}	125 V DC ... 440 V DC							
Max. input current	$I_{PV\ max}$	17 A	2 x 15 A						
Max. input power	P_{DC}	3200 W	4200 W	5300 W					
Number of MPP trackers		1	2						
Max. number of strings (parallel)		2	2 x 2						
Voltage ripple	U_{ss}	< 10 % of the input voltage							
Operating consumption		< 10 W							
a) The maximum open circuit voltage, which can occur at a cell temperature of -10 °C, may not exceed the maximum input voltage.									
Grid Connection Data									
Nominal output power	P_{ACnom}	3000 W	4000 W	4600 W / 5000 W ^{b)}					
Max. output power	P_{ACmax}	3000 W	4000 W	5000 W					
Nominal output current (at 230 V AC)	I_{ACnom}	13 A	17.4 A	20 A					
Max. output current	I_{ACMax}	16 A	22 A	22 A					
Max. fuse protection		32 A							
Harmonic distortion of output current (at $K_{Ugrid} < 2 \%$, $P_{AC} > 0.5 P_{ACnom}$)	K_{IAC}	< 4 % < 3 % at P_{ACNom})							
Nominal AC voltage	U_{ACnom}	220 V, 230 V, 240 V							
Operating range	U_{AC}	180 V - 280 V ^{b)}							
AC grid frequency	f_{ACnom}	50 Hz, 60 Hz / ± 5 Hz							
Operating range	f_{AC}	45 - 65 Hz ^{b)}							
Power factor (at nominal output power)	$\cos \phi$	1							
Overvoltage category		III							
Test voltage (50 Hz)		1.4 kV (1 s routine testing / 5 s type testing)							
Test surge voltage		4 kV (serial interface: 6 kV)							
Internal consumption at night		< 0.5 W							
b) depending on country configuration									

	SB 3000TL-20	SB 4000TL-20	SB 5000TL-20
General Data			
EC Declaration of Conformity	enclosed set of documents, download area www.SMA.de		
Dimensions (w x h x d)	approx. 470 mm x 445 mm x 180 mm		
Weight	approx. 25 kg		
Protection rating in accordance with DIN EN 60529	IP 65 Electronics Connection area: IP 54		
Climatic conditions according to DIN EN 50178:1998-04:			
Installation type C:	class 4K4H extended temperature range: -25 °C to +60 °C extended air humidity range: 0 ... 100 % extended air pressure range: 79.5 kPa to 106 kPa		
Transport type E:	class 2K3 temperature range: -25 °C ... +70 °C		
Operating temperature range	-25 °C ... +60 °C		
Max. operating altitude	2000 m above sea level NN		
Topology	transformerless		
Protection class	I		
Protective function DC side			
All-pole disconnection unit on the DC side	Electronic Solar Switch, DC plug connector		
Surge protection	thermally monitored varistors		
Personal protection	insulation monitoring (Riso 1 M Ohm) integrated all-pole sensitive leakage current monitoring unit		
Pole Confusion Protection	via short-circuit diode		

	SB 3000TL-20	SB 4000TL-20	SB 5000TL-20
Protective function AC Side			
Short circuit proof	current control		
All-pole disconnection unit on grid side	Automatic disconnection device (SMA grid guard 3)		
Efficiency			
max. efficiency	eta max	97.0 %	
European standard efficiency	eta euro	96.3 %	96.2 %
		96.5 %	
Communication interfaces			
Bluetooth	as standard		
RS485 (galvanically isolated)	optional		
Electronic Solar Switch (ESS)			
Electrical service life (in case of a short circuit, with a nominal current of 35 A)	min. 50 switching processes		
Maximum switching current	35 A		
Maximum switching voltage	800 V		
Maximum PV power	approx. 12 kW		
Protection rating when plugged in	IP65		
Protection rating when unplugged	IP21		

Efficiency curve



14 Accessories

In the following overview you will find the relevant accessories and replacement parts for your product. When necessary, you can procure these from SMA Solar Technology or from your dealer.

Designation	Brief Description	SMA order number	
		SB 3000TL-20	SB 4000TL-20 SB 5000TL-20
Replacement varistors	Set of thermally monitored varistors	SB-TV4 (2 units)	MSWR-TV8 (3 units)
ESS handle	Electronic Solar Switch handle as replacement part	ESS-HANDLE:05	ESS-HANDLE:05
RS485 upgrade kit	RS485 interface	DM-485CB-10	DM-485CB-10

15 Contact

If you have technical problems concerning our products, please contact the SMA Service Line. We require the following information in order to provide you with the necessary assistance:

- Inverter Type
- Series number of the Sunny Boy
- Type and number of modules connected
- Event number or display of the Sunny Boy
- type of communication, if applicable
- Type of fault signaling contact connected, if applicable

SMA Solar Technology AG

Sonnenallee 1

D34266 Niestetal, Germany

www.SMA.de

SERVICE LINE

Inverter: +49 561 9522 1499

Communication: +49 561 9522 2499

SMS-Callback: +49 176 888 222 44

Fax: +49 561 9522 4699

serviceline@SMA.de

The information contained in this document is the property of SMA Solar Technology AG. Publishing its content, either partially or in full, requires the written permission of SMA Solar Technology AG. Any internal company copying of the document for the purposes of evaluating the product or its correct implementation is allowed and does not require permission.

Exclusion of liability

The general terms and conditions of delivery of SMA Solar Technology AG shall apply.

The content of these documents is continually checked and amended, where necessary. However, discrepancies cannot be excluded. No guarantee is made for the completeness of these documents. The latest version is available online at www.SMA.de or from the usual sales channels.

Guarantee or liability claims for damages of any kind are excluded if they are caused by one or more of the following:

- Damages during transportation
- Improper or inappropriate use of the product
- Operating the product in an unintended environment
- Operating the product whilst ignoring relevant, statutory safety regulations in the deployment location
- Ignoring safety warnings and instructions contained in all documents relevant to the product
- Operating the product under incorrect safety or protection conditions
- Altering the product or supplied software without authority
- The product malfunctions due to operating attached or neighboring devices beyond statutory limit values
- In case of unforeseen calamity or force majeure

The use of supplied software produced by SMA Solar Technology AG is subject to the following conditions:

- SMA Solar Technology AG rejects any liability for direct or indirect damages arising from the use of software developed by SMA Solar Technology AG. This also applies to the provision or non-provision of support activities.
- Supplied software not developed by SMA Solar Technology AG is subject to the respective licensing and liability agreements of the manufacturer.

SMA Factory Warranty

The current guarantee conditions come enclosed with your device. These are also available online at www.SMA.de and can be downloaded or are available on paper from the usual sales channels if required.

Trademarks

All trademarks are recognized even if these are not marked separately. Missing designations do not mean that a product or brand is not a registered trademark.

SMA Solar Technology AG

Sonnenallee 1
34266 Niestetal
Germany
Tel. +49 561 9522-0
Fax +49 561 9522-100
www.SMA.de
E-Mail: info@SMA.de

© 2004 to 2008 SMA Solar Technology AG. All rights reserved

SMA Solar Technology AG

www.SMA.de

**Sonnenallee 1
34266 Niestetal, Germany
Tel.: +49 561 9522 4000
Fax: +49 561 9522 4040
E-Mail: Vertrieb@SMA.de
Freecall: 0800 SUNNYBOY
Freecall: 0800 78669269**

